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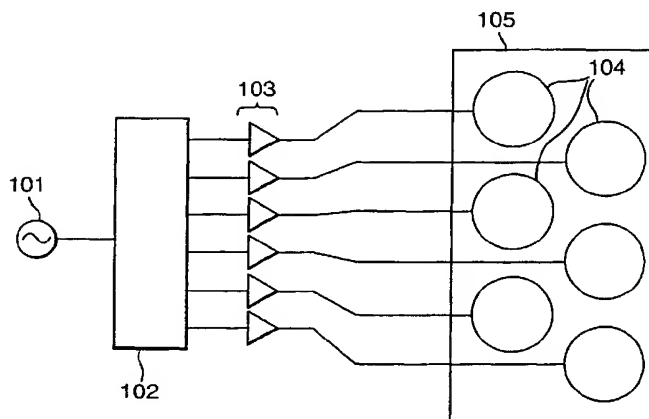
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[Continued on next page]

(54) Title: METHOD AND APPARATUS TO DIRECT SOUND USING AN ARRAY OF OUTPUT TRANSDUCERS



(57) Abstract: The invention relates to sonic steerable antennae and their use to achieve a variety of effects. The invention comprises a method and apparatus for taking an input signal, replicating it a number of times and modifying each of the replicas before routing them to respective output transducers such that a desired sound field is created. This sound field may comprise a directed beam, focus beam or a simulated origin. Further, "anti-sound" may be directed so as to create nulls (quiet spots) in an already existing sound field. The input signal replicas may also be modified in way which changes their amplitude or they may be filtered to provide the desired delaying. Reflective or resonant surfaces may be used to achieve a surround sound effect, a microphone may be located in front of an array of loudspeakers, beams of light may be used to identify the present focal position, a limiting device may be used to ensure that clipping or distortion is reduced when more than one input signal is output by the same device and the concept of beam directivity may be used to achieve input nulls or beams in a microphone made up of an array of input transducers. Further, sound field shaping information may be associated with an audio signal to be broadcast.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H04R1/40 G10K11/178 G01S5/26 G10K11/26 H04R29/00 H04R27/00 H03G11/00 H03G7/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 H04R G10K G01S H03G		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) PAJ, EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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<div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex. </div>		
* Special categories of cited documents : <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed </div> <div style="width: 45%;"> *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family </div> </div>		
Date of the actual completion of the international search <div style="text-align: center; font-weight: bold;">18 October 2001</div>		Date of mailing of the international search report <div style="text-align: center; font-weight: bold;">07 NOV 2001</div>
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer <div style="text-align: center; font-weight: bold;">Blaas, D-L</div>

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Inte. onal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 5 834 647 A (GAUDRIOT LIONEL ET AL) 10 November 1998 (1998-11-10) column 2, line 61 -column 3, line 16 column 8, line 58 - line 62; figures 1-3 ----	15,22, 23,25, 30,31
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5 859 915 A (NORRIS ELWOOD G) 12 January 1999 (1999-01-12) column 3, line 56 -column 4, line 58; figure 2 ---	124
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>DATABASE WPI Section PQ, Week 199224 Derwent Publications Ltd., London, GB; Class P31, AN 1992-198552 XP002166494 & SU 1 678 327 A (KAUN MED INST), 23 September 1991 (1991-09-23) abstract</p> <p>---</p>	124
X	<p>US 5 745 435 A (TASSO REMY ET AL) 28 April 1998 (1998-04-28) column 4, line 6 - line 28; figure 2</p> <p>---</p>	153
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A	<p>abstract</p> <p>---</p>	179,180, 191,193
X	<p>PATENT ABSTRACTS OF JAPAN vol. 012, no. 221 (E-625), 23 June 1988 (1988-06-23) -& JP 63 014588 A (TOSHIBA CORP), 21 January 1988 (1988-01-21) abstract</p> <p>---</p>	167
A	<p>US 5 131 051 A (KISHINAGA SHINJI ET AL) 14 July 1992 (1992-07-14) column 1, line 7 - line 32; figures 1,3</p> <p>---</p>	194
P,A	<p>US 6 084 974 A (NIIMI KOJI) 4 July 2000 (2000-07-04) column 1, line 4 - line 17 column 6, line 56 -column 7, line 21; figure 13</p> <p>---</p>	138,146
A	<p>& JP 06 334459 A 2 December 1994 (1994-12-02)</p> <p>-----</p>	

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT,
part of the additional fees are to be refunded.

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-4, 8-11
2. Claims: 5-7, 12-14
3. Claims: 15-24, 25-32
4. Claims: 33-40, 41-47
5. Claims: 48-69, 77-95
6. Claims: 70-76, 96-102
7. Claims: 103-109, 110-114, 115-119, 120-123
8. Claims: 124-130, 131-137
9. Claims: 138-145, 146-152
10. Claims: 153-166
11. Claims: 167-180, 190-191
12. Claims: 181-189
13. Claims: 192-193

INVITATION TO PAY ADDITIONAL FEES

International application No.

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14. Claims: 194-223

INTERNATIONAL SEARCH REPORT

Information on patent family members

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